CLAIMS:

1. An energy collecting system, comprising:

a heat storage;

a heat source for imparting heat to water supplied from the heat storage by electric power from a commercial power source and thereby producing cool or warm water;

a primary cool/warm water pump for pumping up the water from the heat storage and supplying the water via a sucking pipe to the heat source;

a motor for driving the primary cool/warm water pump;

a water supply pipe disposed between a discharge outlet of the primary cool/warm water pump and the heat source;

a water supply pipe for returning water from a discharge outlet of the heat source to the heat storage;

an expansion tank or a vacuum breaking valve disposed in a highest section of the water supply pipe;

a waterwheel disposed in a lowest section of the water supply pipe for collecting potential energy of the water discharged from the heat source; and

an electric power generator rotated by torque generated by the waterwheel to generate electric power.

2. An energy collecting system according to claim 1, comprising:

an inverter connected to an output port of

the electric power generator for converting a voltage and a frequency of electric power generated by the electric power generator into a desired voltage and a desired frequency;

a system collaboration unit between the motor and a commercial power source for changing a system from the commercial power source to a side of the motor or from the inverter to a side of the commercial power source; and

a cable for connecting an electric path between the system collaboration unit and the motor to an output port of the inverter.

3. An energy collecting system according to claim 1, comprising:

an inverter connected to an output port of the electric power generator for converting a voltage and a frequency of electric power generated by the electric power generator into a desired voltage and a desired frequency;

a system collaboration unit between the motor and a commercial power source for changing a system from the commercial power source to a side of the motor or from the inverter to a side of the commercial power source; and

a cable for connecting an electric path between the system collaboration unit and the motor to an output port of the inverter, wherein the motor to drive the primary cool/warm water pump is driven by

electric power obtained by adding the power generated by the waterwheel to the power of the commercial power source.

4. An energy collecting system according to claim 1, comprising:

an inverter connected to an output port of the electric power generator for converting a voltage and a frequency of electric power generated by the electric power generator into a desired voltage and a desired frequency;

a system collaboration unit between the heat source and a commercial power source for changing a system from the commercial power source to a side of the heat source or from the inverter to a side of the commercial power source; and

a cable for connecting an electric path between the system collaboration unit and the heat source to an output port of the inverter.

5. An energy collecting system according to claim 1, comprising:

an inverter connected to an output port of the electric power generator for converting a voltage and a frequency of electric power generated by the electric power generator into a desired voltage and a desired frequency;

a system collaboration unit between the heat source and a commercial power source for changing a system from the commercial power source to a side of

the heat source or from the inverter to a side of the commercial power source; and

a cable for connecting an electric path between the system collaboration unit and the heat source to an output port of the inverter,

wherein the heat source is driven by electric power obtained by adding the power generated by the waterwheel to the power of the commercial power source.

6. An energy collecting system according to claim 1, wherein the electric power generated by the electric power generator is supplied to a load such as a lighting apparatus in a machine room.

7. An energy collecting system according to claim 1, comprising an electric power change-over unit for changing a system, when power is not being generated, from a commercial power source to a load side and for changing the system, when power is being generated, from the electric power generator to a load side, wherein

the electric power generated by the electric power generator is supplied to a load such as a lighting apparatus in a machine room.

8. An energy collecting system according to claim 1, comprising:

an inverter for converting the generated electric power desired by a load connected to an output port of the electric power generator into a voltage and a frequency;

a system collaboration unit between the load and a commercial power source for changing a system from the commercial power source to a side of the load or from the inverter to a side of the commercial power source; and

a cable for connecting an electric path between the system collaboration unit and the load to an output port of the inverter.

9. An energy collecting system according to one of claim 1, comprising:

a bypass pipe and a bypass valve bypassing the waterwheel; and

pressure sensors disposed at an inlet and an output of the waterwheel.

10. A method of operating an energy collecting system comprising:

a heat storage;

a heat source for imparting heat to water supplied from the heat storage by electric power from a commercial power source and thereby producing cool or warm water;

a commercial power source for supplying electric power to the heat source;

a primary cool/warm water pump for pumping up the water from the heat storage and supplying the water via a sucking pipe to the heat source;

a motor for driving the primary cool/warm water pump;

a water supply pipe disposed between a discharge outlet of the primary cool/warm water pump and the heat source;

a water supply pipe for returning water from a discharge outlet of the heat source to the heat storage;

an expansion tank or a vacuum breaking valve disposed in a highest section of the water supply pipe;

a waterwheel disposed in a lowest section of the water supply pipe for collecting potential energy of the water discharged from the heat source;

an electric power generator rotated by torque generated by the waterwheel to generate electric power; and

an inverter connected to an output port of the electric power generator,

the inverter converting the generated electric power desired by a load side into a voltage and a frequency and supplying the power to the motor to drive the primary cool/warm water pump, wherein the respective units collaboratively operate according to steps below:

<To start operation>

1. Open a waterwheel inlet valve, close a waterwheel outlet valve, and close a waterwheel bypass valve.

2. Power the heat source.

3. Power the motor to drive the primary cool/warm pump.

4. Transmit a request signal from the heat source side to operate the primary cool/warm pump.

5. Receive the operation request signal, operate the motor to drive the primary cool/warm pump, and transmit an operation answer signal to the heat source.

6. Operate the heat source when a predetermined period of time lapses after the operation answer signal is received.

7. When a predetermined period of time lapses after the heat source is operated, close the waterwheel outlet valve and operate the waterwheel. Operate the electric power generator.

8. Supply generated electric power via the inverter to the motor to drive the primary cool/warm pump.

<To stop operation>

1. Close the waterwheel outlet valve and stop the waterwheel. Stop the electric power generator.

2. Stop supplying the generated power, stop the inverter, stop supplying power to the motor to drive the primary cool/warm pump.

3. Transmit a stop request signal from the heat source side to the primary cool/warm pump side. Stop the heat source.

4. Receive the stop request signal, stop the motor to drive the primary cool/warm pump, and return a stop answer signal to the heat source.

5. Interrupt the power to the motor to drive the primary cool/warm pump and interrupt the power to the

heat source.

11. A method of operating an energy collecting system comprising:

a heat storage;

a heat source for imparting heat to water supplied from the heat storage by electric power from a commercial power source and thereby producing cool or warm water;

a commercial power source for supplying electric power to the heat source;

a primary cool/warm water pump for pumping up the water from the heat storage and supplying the water via a sucking pipe to the heat source;

a motor for driving the primary cool/warm water pump;

a water supply pipe disposed between a discharge outlet of the primary cool/warm water pump and the heat source;

a water supply pipe for returning water from a discharge outlet of the heat source to the heat storage;

an expansion tank or a vacuum breaking valve disposed in a highest section of the water supply pipe;

a waterwheel disposed in a lowest section of the water supply pipe for collecting potential energy of the water discharged from the heat source;

an automatic valve disposed to bypass the waterwheel;

an automatic valve disposed in the an inlet or outlet of the waterwheel;

pressure sensors disposed in the outlet and the inlet of the waterwheel;

an electric power generator rotated by torque generated by the waterwheel to generate electric power; and

an inverter connected to an output port of the electric power generator,

the inverter converting the generated electric power desired by a load side into a voltage and a frequency and supplying the power to the motor to drive the primary cool/warm water pump, wherein the respective units automatically and collaboratively operate according to steps below:

<To start operation>

1. Close the waterwheel bypass valve.
2. Power the heat source.
3. Power the motor to drive the primary cool/warm pump.
4. Transmit a request signal from the heat source side to operate the primary cool/warm pump.
5. Receive the operation request signal, operate the motor to drive the primary cool/warm pump, and transmit an operation answer signal to the heat source.
6. Operate the heat source when a predetermined period of time lapses after the operation answer signal is received.

7. When pressure at the waterwheel inlet reaches predetermined pressure, the automatic valves in the outlet of the waterwheel open and the waterwheel operates. The electric power generator operates in association therewith.

8. Supply generated electric power via the inverter to the motor to drive the primary cool/warm pump.

<To stop operation>

9. When a predetermined period lapses after the heat source is operated, close the automatic outlet and inlet valves of the waterwheel and stop the waterwheel. Stop the electric power generator.

10. Stop supplying the generated power, stop the inverter, stop supplying power to the motor to drive the primary cool/warm pump.

11. Transmit a stop request signal from the heat source side to the primary cool/warm pump side.

12. Receive the stop request signal, stop the motor to drive the primary cool/warm pump, and return a stop answer signal to the heat source.

13. Interrupt the power to the motor to drive the primary cool/warm pump and interrupt the power to the heat source.

12. A method of operating an energy collecting system according to claim 10, comprising a step of completely opening the automatic valves in the waterwheel outlet and inlet when the heat source operates and the pressure sensor in the waterwheel

inlet senses the predetermined pressure.

13. An energy collecting system, wherein:

a water pump to supply water to a group of air-conditioning loads is driven by an inverter;

a waterwheel is operated by potential energy of water used by the air-conditioning loads;

an electric power generator is operated by torque generated by the waterwheel; and

power generated by the electric power generator is converted by an inverter into direct-current (dc) power.

14. An energy collecting system according to claim 13, wherein the dc power is returned as dc power of the inverter.

15. An energy collecting system according to claim 13, whereinthe dc power is returned as dc power of an inverter other than the inverter.

16. An energy collecting apparatus, comprising:

a heat storage;

a water pump of a secondary system for pumping up water from the heat storage and supplying the water to a group of air-conditioning loads;

a first inverter for driving the water pump;

a first water supply pipe disposed between a discharge outlet of the water pump and the group of air-conditioning loads;

a second water supply pipe for returning water discharged from a discharge outlet of the group

of air-conditioning loads to the heat storage;

an expansion tank or a vacuum breaking valve disposed in a highest section of the second water supply pipe;

a waterwheel disposed in a lower section of the second water supply pipe for collecting potential energy of the water discharged from the group of air-conditioning loads; and

an electric power generator rotated by torque generated by the waterwheel to generate electric power.

17. An energy collecting apparatus according to claim 16, comprising:

a second inverter connected to an output port of the electric power generator to generate dc power; and

means for connecting the first inverter to a dc section of the second inverter, wherein

the dc power generated by the second inverter is returned to the first inverter.

18. An energy collecting apparatus according to claim 16, comprising:

a second inverter connected to an output port of the electric power generator to generate dc power; and

means for connecting a dc section of the second inverter to an inverter other than the second inverter, wherein

the dc power generated by the second inverter

is returned to the inverter other than the second inverter.

19. An energy collecting apparatus according to one of claim 16, wherein the first and second inverters are incorporated in a control board.

20. An energy collecting system, comprising:

a heat storage for storing therein water obtained from a heat source;

a heat source for producing cool or warm water using water from the heat storage;

a pump for supplying the water from the heat storage to the heat source;

a motor for driving the pump;

a waterwheel rotated by the water supplied from the heat source;

an electric power generator driven by the waterwheel to generate electric power;

an inverter connected to an output port of the electric power generator;

a system collaboration unit disposed between the motor and a commercial power source,

the system collaboration unit conducting a change-over operation between a system connecting the commercial power source to the motor and a system connecting the inverter to the commercial power source; and

a connecting line for connecting an electric path between the system collaboration unit and the

motor to an output port of the inverter.